Product Manual

232-ATSC

HDTV Tuner
March 9, 2006

Contemporary Research

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Overview

The 232-ATSC HDTV Tuner is an integrator-friendly universal HDTV tuner, controllable via two-way RS-232 and discrete IR commands. Able to fit two-across in a 2RU rack space, the compact tuner outputs HDMI, RGB/Component, and composite video simultaneously. NTSC broadcasts are upscaled for HD display. Digital audio is available from HDMI, coax, and optical connections, as well as variable-level stereo audio. Setup is a snap, employing on-screen menus, included IR remote, front-panel programming, and RS-232 control commands.

For home theater applications, the 232-ATSC offers no-compromise full-bandwidth image quality of local HDTV broadcasts and can access multi-channel programs - features not supported by over-compressed cable and satellite "HD" programming.

For commercial installations, the 232-ATSC tunes in today's and tomorrow's programming, and can receive conventional cable channels as well as local HDTV broadcasts from an off-air antenna.

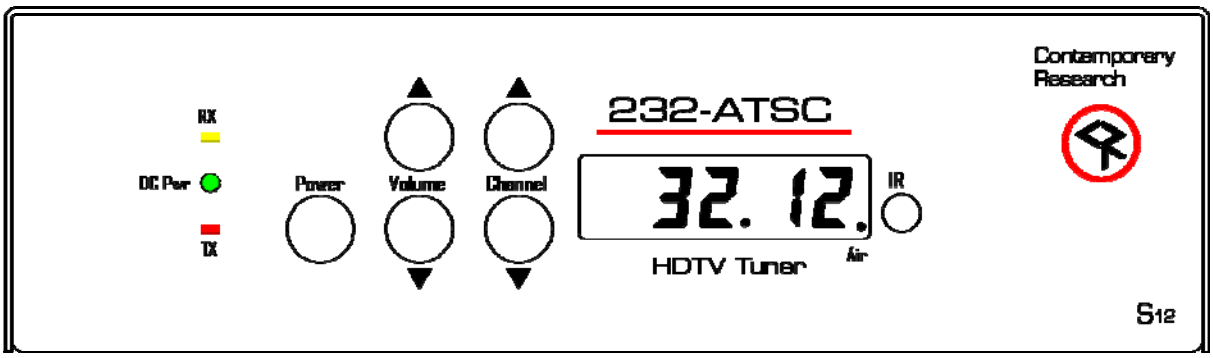
- **Universal Tuning** – Handles a mix of ATSC, clear QAM and NTSC channels
- **Pro Integration** - Features 2-way RS-232 control and feedback with simple ASCII commands, as well as discrete IR and wired IR - AMX and Crestron modules available
- **Dual Channel RF –** Tune channels from switchable Cable and Off-Air RF inputs
- **Fast Tuning -** Changes analog and digital channels instantly with improved RF reception
- **Total Video -** Simultaneous HDMI, RGB/Component, and composite video output (RGB and Component switchable)
- **Total Audio -** Simultaneous digital 5.1 HDMI, coax, and optical outputs, as well as analog stereo
- **HD Scaling -** Upscales NTSC broadcasts for HD output
- **Easy Set-up** - Front-panel programming supported by LCD display, on-screen menus using HD2-RC IR remote (included), and RS-232 control commands
- **Closed Captioning** - Displays analog and digital captioning text
- **On-Screen Menus** - Setup, Electronic Program Guide, Channel, Favorites, and Program Information menus
- **Compact Rack Mounting** - Mounts in 2RU single RK1-HD or dual RK2-HD 19” rack kits
- **Includes** - HD2-RC IR wireless remote, 12 VDC switching power supply
- **Green Machine** - Meets RoHS safety and California energy standards

Specifications

Physical

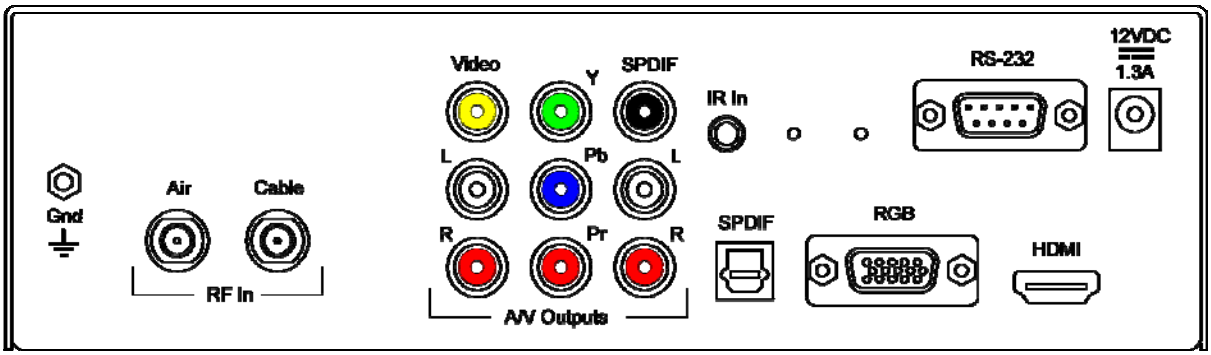
Size (HWD): 1.75” [38mm] height (1RU) x 8.5” [216mm] wide x 6.0” [153mm] deep
Weight: 2.25 lbs [1 kg]
Enclosure: Steel with black powder coat paint
Mounting: Rack mounting for one or two units side-by-side optional (RK1-HD, RK2-HD)

Front Panel



LEDs: DC Power (Green), RS-232 RX (Yellow), RS-232 TX (Red)
Control: Power, Volume Up/Down, Channel Up/Down
Display: Red LED Channel Display, dot separated major and minor channel numbers,
Air: Dot at end of display indicates Off-Air tuning
IR: IR sensor

Rear Panel



RF In: 2 'F', female, 75 ohm impedance, Off-air and cable
User can switch between inputs
Video Output: Simultaneous HDMI, Component/RGB/NTSC video out
Video Out: RCA composite video output, 1V p-p at 75 ohm impedance, 480i
Component Out: 3 RCA Pr, Pb, Y outputs (1080i/720p/480p/480i)
RGB Out: RGB DB-15 female (1080i/720p/480p)
HDMI: HDMI receptacle, Type A, HD video and digital audio, version 1.2
Audio Output: Simultaneous HDMI, Coax, Optical, and Stereo
Digital Audio S/PDIF: Coax and TOSlink optical output, 5.1 AC3/PCM
Analog Audio Out: Stereo RCA audio, Mono, Stereo, or SAP, variable level
RS-232 Control: DB-9 male, RS-232 data link to control system or PC, link up to 9 tuners
IR In: 3.5 mm stereo input for external IR sensor or wired IR (no carrier, discrete codes available)
Power In: 2.1mm coaxial jack (inside center conductor positive)
1.3 A maximum, 11.5 to 15 VDC, 12 VDC typical

Tuning

Frequency Range: ATSC and Clear QAM (cable) television 55.25 to 801.25 MHz
TV System: ATSC, NTSC, Cable, and Clear QAM (1080i/720p/480p/480i)
Tuning: Off-air 14-69 and CATV 1-135
Aspect Ratio: Letter Box, Cropped, or Squeezed
Captioning: DTV and analog, set by program or customized for size, font and display attributes
Lock: Parental option for channels and/or rating

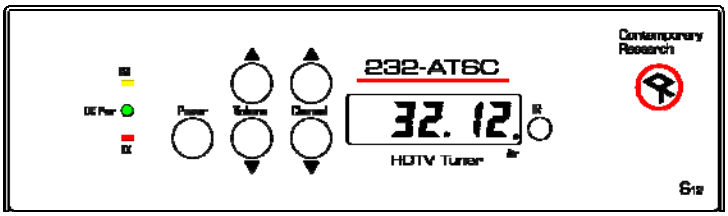
Includes

HD2-RC IR Tuner Remote, 4 AAA batteries
Power Supply, 1.5A maximum, 12 VDC

Options

IR-RXC External IR Receiver
RK1-HD Single Rack Kit
RK2-HD Dual Rack Kit
CC-232 RS-232 Cable

Front Panel Setup



To Enter a Front Panel Programming Mode:

1. Press **and hold** the Power button such that the red LED light above is lit (indicating Mute On).
2. Press Volume Up.
3. Release all buttons, the 232-ATSC will now be in the front panel programming mode.
4. The front panel display is dedicated to programming information display while in this mode.
5. Changes are saved in non-volatile memory as they are entered.
6. The Volume up/down buttons scroll through programming modes 0 through 9 and 10+.
7. The Channel up/down buttons scroll through possible parameters for each mode.

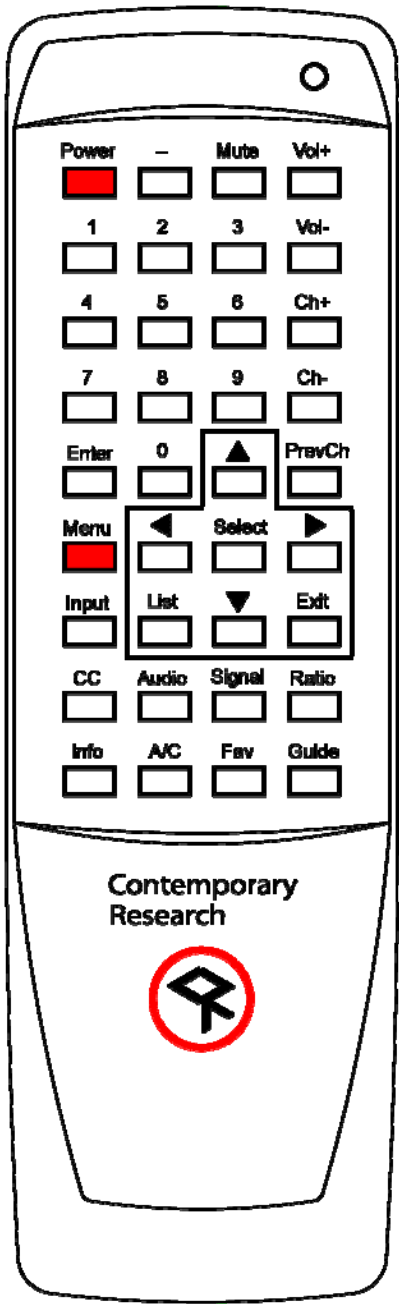
To Exit the Front Panel Mode

Push and release the Power button.

Mode		Parameters
Baud Rate	**1.1** **1.2** **1.3** **1.4** **1.5** **1.6** **1.7**	300 600 1200 2400 4800 9600 (Default) 19200
Unit Number	**2.1** **2.2** **2.3** **2.x**	One (Default) Two Three Four – Nine
Not Used	**3.0**	
Panel Lockout	**4.0** **4.1** **4.2** **4.3** **4.4** **4.5** **4.6** **4.7**	None (Default) Channel up/dwn Volume up/dwn Channel & Volume up/dwn Power Channel up/dwn & Power Volume up/dwn & Power All
Power-up Volume	**5.0** **5.X**	Restore previous level **1 – 63** sets volume level
Firmware Version	**6.40**	Ex: Version 6.4 - Press and hold Channel Up, then Power to restore tuner to default settings
IR Receive	**15.0** **15.9**	0 - No IR reception 9 - CR 9 (Default)
HD Output	**18.0** **18.1** **18.2**	RGB (Default) N/A Component
HD Format	**19.0** **19.1** **19.2** **19.3**	0=1080i 1=720p 2=480p 3=480i

HD2-RC IR Remote

The HD2-RC IR Remote included with the 232-ATSC can be used to setup the tuner and for daily operation. All of the functions on the remote have equivalent commands in RS-232, Ethernet, and Wired IR formats. In addition, the 232-ATSC front panel buttons can perform Power, Channel, and Volume control.



Power
Turns tuner on and off. Discrete on and off IR commands are available as well.

Volume Control
Use the **Vol+**, **Vol-** and **Mute** buttons.

Channel Selection
The key change in digital tuning is the need to add a dash (**-**) and number after the traditional channel number. Analog channels are accessed using XX-0, digital channels using XX-1 (or -2, -3, etc).

Ch+, Ch- and PrevCh can be used to access and recall channels.

Menu Operation
Press Menu to access the on-screen menus.

- Use the directional **Arrows**, **Select** and **Exit** to navigate the menus.
- **List** displays the list of all channels, arrow keys add/remove channels, set Favorite Channel list
- **Exit** steps backwards out of menus
- **Enter** selects menu choice

Special Functions

- **CC** steps through available closed-captioning options
- **Audio** selects audio and SAP modes
- **Signal** displays channel signal level
- **Ratio** steps through aspect ratios, options depend on channel and output types
- **Info** launches on-screen information window
- **A/C** selects Air or Cable tuning
- **Fav** Displays list of favorite channels
- **Guide** displays on-screen Guide

Features of many of the Special Function commands depend on whether the current channel is analog or digital.

On-Screen Menus

Main Menu

Selects sub-menus.

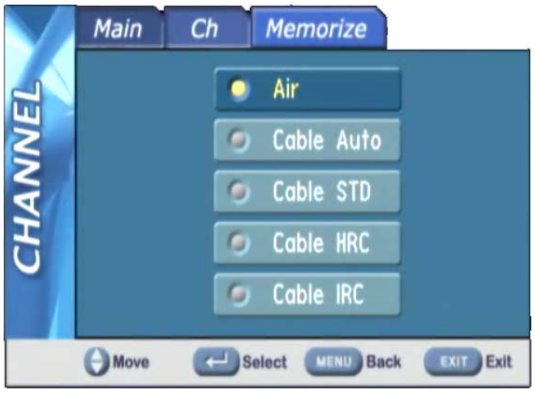
- Arrow keys highlight option
- Select (or Enter) chooses option
- Menu steps back or exits menus
- Exit exits all menus
- Some options are only available if you are currently tuned to an analog or digital channel

Channel Menus

Sub-Menu for Channels offers options for:

- Channel Auto-Scan
- Favorite Channel Selection
- Add/Delete Channels
- Fine Tune (If tuned to an analog channel)
- Signal Strength Meter

Auto-Scan

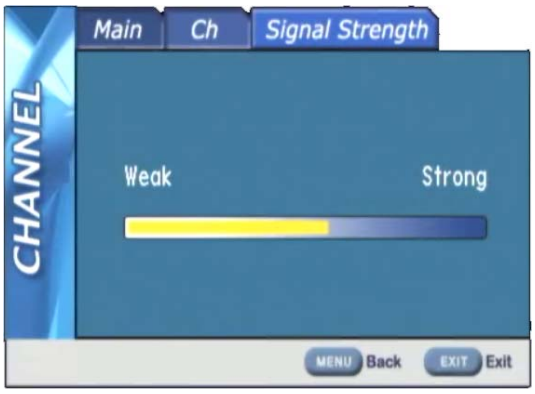


Starts scan of analog and digital channels for:

- Air – looks for NTSC and ATSC channels
- Cable Auto – looks for analog and digital QAM cable channels, as well as:
    - Cable STD - standard cable spacing
    - Cable HRC – HRC cable spacing
    - Cable IRC – IRC cable spacing

Tip:

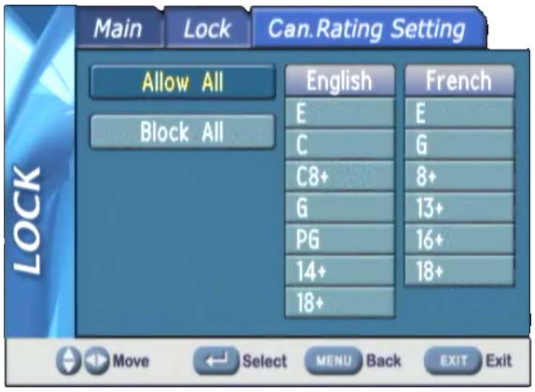
Normally, cable channels will be in standard frequencies. If all the channels tune in STD but channels 5 and 6, scan for IRC. If few channels can be found, scan for HRC.

Favorite Channels 	Menu is also displayed from the List command, selects channels advanced by the FAV favorite channel command. Use the Up, Down arrows to move through the list, press Select to add a channel to Favorites.
Channel Add/Delete 	This menu can add or delete a channel accessed from Channel Up and Down. You can tune to a channel you want to delete, then press Menu/Channel/Add-Delete. Press Select to delete the channel. You can also keep the page on screen as you step through channels, adding and deleting as desired. If the channel has a good signal, it will be displayed in the background. Note that HDTV channels are broadcast on UHF frequencies. The Add/Delete will show the name of the digital channel, as well as the actual UHF channel used for broadcasting. You can delete one of a digital channel's sub-channels without affecting the others.
Signal Strength 	This page also displays from the Signal remote command. The graphic shows the current signal strength, and changes in real time. This allows you to monitor the strength of a channel as you adjust the antenna for best reception.

Caption Menus	

	This menu accesses captioning features:
	• On/Off – turn captions on/off – *other options are not available if captions are off.*
	• **Analog Mode** - CC 1-4 and Text 1-4
	• Digital Mode – Service 1-6
	• Digital Font Options
	  • **Size** – Standard (15 pixels), Large (21 pixels), or Small (11 pixels)
	  • **Style** – 1-6
	  • **Color** – 8 shade of background, foreground and edge colors
	  • **Opacity –** foreground and background
	  • **Edge –** 6 style options
	
	Version displays current version of tuner firmware

V-Chip Settings Menus	
	Manages access to programming for US and Canadian standards. The default PIN number for access is **0000** (four zeros.
Change PIN 	Enter and confirm new PIN for access.

US Rating 	Use arrows and Select functions to select level of Movie and TV rating allowed.
Canada Rating 	Use arrows and Select functions to select level of Movie and TV rating allowed.
Setup Menus	
	This series of menus select the options for tuner operation: • Screen Format – 16:9 or 4:3 • Time • Sound Settings • Video Noise Reduction - On/Off (if tuned to analog) Set to On – helps to clean up analog channels • Menu Language – English, Spanish, French

Screen Format 	Selects between 4:3 and 16:9 aspect ratios. The Ratio command can also adjust the settings.
Time 	Sets time settings for: • Daylight Saving – Select and choose on or off • Time Zone – Select local time Zone
Time Zone 	Use left-right cursors to select the time zone, Select enters the current zone.
Sound 	Selects a variety of options, each is only active when you are currently tuned into an analog or digital channel: • Analog MTS – Mono, Stereo, SAP (same as Audio) • Multi-Track – English, French, Spanish • Digital Out – 5.1 or PCM • Auto Volume – On or off

Pop-Up Menus	Appear from control commands
Info 	Activated from Info command. • Channel – Analog or digital, Mode, Name • Time – current time and date • Program – Times and name (if digital) • Details – Resolution, Audio Mode, Captions, Rating
Guide 	Shows the day's programming guide for current station. Use Up or Down arrows to move through Guide.

RS-232 Control Protocol

Overview

The 232-ATSC full duplex RS-232 enables a system programmer to control all TV Tuner functions as well as monitor TV Tuner status. All commands are sent as ASCII strings. No delays between characters or commands are required, as data is interrupt driven and buffered.

The 3 status groups are: Channel/Source Select, Audio Levels/Mode and Front Panel. The Mute A/V button-function status from the 232-ATSC front panel has been grouped with the Channel/Source for simplicity in the most common modes of operation. Each of the groups has one ASCII status response string containing all of the status data for that group. The current status string of a group is sent from the 232-ATSC whenever a valid command for that group is received by the 232-ATSC RS-232 port or front panel. A group's status may be requested at any time via the RS-232 port. Status of all 3 groups is sent at power up. The format of each group's status response string remains the same always.

Up to 9 232-ATSC units may be cabled together and addressed for individual control from a single RS-232 port. Each 232-ATSC is assigned a unique unit code.

Communications parameters (Front Panel Mode 1) are 300 to 9600 baud, 8 data bits, No parity, and 1 stop bit. Factory default is 9600 baud, Unit#1.

All settings are saved to NVRAM in the 232-ATSC.

The tuner will accept non-standard RS-232 control such as voltage that swings from 0 to +5 VDC, commonly found when IR ports are used to send RS-232 commands.

General protocol specifications

Characters in command strings to the 232-ATSC are common ASCII keyboard characters.

Command strings sent to the 232-ATSC begin with the ASCII > (greater than symbol) as an 'Attention' character and end with carriage return - ASCII CR, Hex $0D, or keyboard Enter - as an 'End-of-command' character.

Responses from the 232-ATSC begin with the ASCII < (less than symbol) as an 'Attention' character and end with a carriage return followed by line feed an ASCII LF or Hex $0A as 'End-of-command' characters.

A carriage return is required at the end of each command and is assumed in all examples.

Command String Structure

[Attention] (Unit#) [Command] (Parameters) [Return]

Attention	Single character (>) starts the string
Unit#	The Unit# is expressed as an ASCII 0-9 when used in multiple tuner applications. To address all units, use a Unit # of 0 (Zero) No unit number will default to Unit#1
Command	A two-character command
Parameters	Added attributes to some commands
Return	A carriage return ends the command string, you may use ASCII CR, Hex $0D, or keyboard 'Enter' in programming. For simplicity, the programming examples in the manual will not show the 'CR' – so remember, you'll need to add it in your control code.

Code	Function	Operation
	Front Panel	
S4=	Set front panel lockout mode	0 None 1 Ch+Menu 2 Vol+Menu 6 Menu 3 Ch+Vol+Menu 7 All 4 Pwr 8 Setup+Menu 5 Setup 9 Pwr+Set+Menu
Q5=	Set IR Receive mode	0 - No IR reception 9 - CR 9 (Default)
KK=105	Menu	Opens on-screen menus
KK=106	Arrow Right	Arrow Left
KK=107	Arrow Left	Arrow Down
KK=108	Arrow Up	Arrow Up
KK=109	Arrow Down	Arrow Down
KK=110	Enter	Enter
KK=111	Exit	Exits menus
KK=95	List	Displays on-screen list to select favorite channels
P1	Power On	On
P0	Power Off	Standby, mutes audio and video
PT	Power Off/On	Power toggle
XX	Power On	On (same as 232-series Mute Off)
XM	Power Off	Standby (same as 232-series Mute On)
XT	Power Off/On	Power toggle (same as 232-series Mute Toggle)
	Tuning	
TC=	Select tuned channel	Tunes digital (xxx-1) channels *Examples:* '>TC=28:1' Selects channel 28-1 '>TC=28-2' Selects channel 28-2 '>TC=32' Selects channel 32-1
TU	Tune channel up *Example:* '>3TU'	Selects next higher channel in channel list Bumps Unit#3 tuned channel up
TD	Tune channel down	Selects next lower channel in channel list
TP	Previous channel	Selects previously viewed channel
KK=88	Fav	Steps through favorite channels (selected in List menu)
KK=153	Air	Sets tuner for antenna (Off-Air) tuning
KK=154	Cable	Sets tuner for cable tuning
KK=149	RGB	Selects RGB output
KK=150	YPbPr	Selects Component (YPbPr) output
KK=85	Audio	Selects alternate audio options

Code	Function	Operation
	Display	
KK=82	Ratio	Steps through aspect ratios, options depend on channel and output types
KK=81	Signal	Displays signal Strength
KK=100	Info	Launches on-screen information window
KK=62	Guide	Displays Electronic Program Guide
KK=115	CC – Closed captions	Steps through captioning options
	Audio	
VU	Ramp volume up	Starts volume ramping up
VD	Ramp volume down	Starts volume ramping down
VX	Volume Mute off	Restores audio volume to previous level
VM	Volume Mute on ***Example:*** '>VM'	Turns off audio outputs Mutes audio outputs
VV	Stop volume ramp	Stops volume ramping
VT	Toggle Volume Mute	Alternates audio mute on and off
KK=85	Audio Mode	Step through audio mode options for mono, stereo, SAP
	Status Request	
SQ	Request Q Mode status	Unit sends "Q" Mode status string
SS	Request Front Panel status	Unit sends "S" Front Panel status string
ST	Request Channel status *Example:* '>ST'	Unit sends "T" Channel/Source status string Returns Channel/Source status response string
SV	Request AV status	Unit sends "V" Audio status string

A carriage return is required at the end of each command and is assumed in all examples. The '=' sign for parameters may be omitted if desired, though it is helpful for clarity in checking programming.

Terminal Communication Commands

EF	Echo Off	Characters received will not be re-transmitted (power up default).
EN	Echo On	Characters received will be re-transmitted. *Example:* '>EN' Characters received will be re-transmitted.
ID	Product ID	Returns the product model number and firmware version.
Z!	Zap	Reconfigures unit for all factory default settings.

HD2-RC Remote Emulation

You can also emulate IR commands sent from the CR HD2-RC Wireless Remote. If you are using the numeric keys to select a channel, the user or program will need to follow the numeric command with an Enter.

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KK=<key>	* = Reserved for future products/applications 0=* 1=* 2=* 3=* 4=* 5=* 6=* 7=* 8=* 9=Power (tog) 10=0 11=1 12=2 13=3 14=4 15=5 16=6 17=7 18=8 19=9 20= 21=Enter/Select 22=Ch Up 23=Ch Dn 24=Vol Up 25=Vol Dn 26=Vol Mute (tog) 27=Power On 28=Power Off 29=Menu 63=Guide 62=Air/Cable 80=Freeze 81=Signal 82=Ratio 83=Format 85=Audio	88=Favorite 95=List 98=Air/Cable 99=Dash - 100=Info 101=Prev Chan 105=Menu 106=Cur Rt 107=Cur Lt 108=Cur Up 109=Cur Dn 110=Enter/Select 111=Exit 115=CC 141=Format 1080i 142=Format 720p 143=Format 480p 144=Format 480i 149=Output RGB 151=Output YPbPr 153=Air 154=Cable

Response Strings

Typical: [Attention] [Unit#] [data ...data] [cr] [lf]

232-ATSC status response strings contain ASCII characters similar to those used for the same functions in command strings. An ASCII 'carriage return' and 'line feed' follow each response string. Functions shown as N/A are not applicable or available as yet in the 232-ATSC; characters will appear in status strings as lower-case x.

Channel/Source Status Response String (T):

Start	#	CMD	Power	Major Channel	Video Mute	Input	RF	NA	Minor Channel	NA	Function
	1-9		U=On M=Off	3 digits	Un-muted	0=Channel	A=Air C=Cable		3 digits		0=None
<	**1**	**T**	**U**	**032**	**U**	**0**	**A**	**x**	**002**	**x**	**0**

For compatibility with 232-series tuners, 232-ATSC (XXX-XX) channels are split into Channel 1 (Major) and Channel 2 (Minor) sections.

Audio Status Response String (V):

Start	Unit	CMD	Power	Volume 1	Volume Mute	Stereo	Volume 2
	1-9		U=On M=Off	0-63 Emulated level 2 digits	U=Unmuted M=Mute	N/A	0-100 Actual level 3 digits
<	**1**	**V**	**U**	**63**	**U**	**x**	**075**

Volume 1 emulates 232-series volume level for compatibility with existing applications.
Volume 2 shows actual 232-ATSC level, from 0-100 steps.

Front Panel Mode Status Response String (S):

Start	Unit	CMD	Audio	Tune Mode	Lockout	Bass	Treble	Output	Ratio Current	Ratio Mode	NA
	1-9		N/A	N/A 1 digit	0-9	Fixed 2 digits	Fixed	0=RGB 1=DVI 2=YPbPr 3=Video	0-3 0=1080i 1=720p 2=480p 3=480i	1-7*	3 digits
<	**1**	**S**	**x**	**x**	**1**	**08**	**4**	**1**	**1**	**6**	**xxx**

Current Ratio is the actual output ratio; Ratio Mode is the selected mode (see chart on page 9)

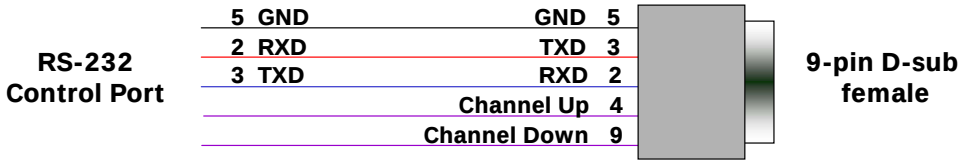
Q Mode Response String (Q):

Start	Unit	CMD	Q0	Q1	Q2	Q3	Q4	Q5	NA
	1-9		N/A	N/A	N/A	N/A	N/A	IR 0=Off A=Normal	4 digits
<	**1**	**Q**	**x**	**x**	**x**	**x**	**x**	**A**	**xxxx**

RS-232 Cable Connections

Single Tuner

Control Wiring – Single Unit



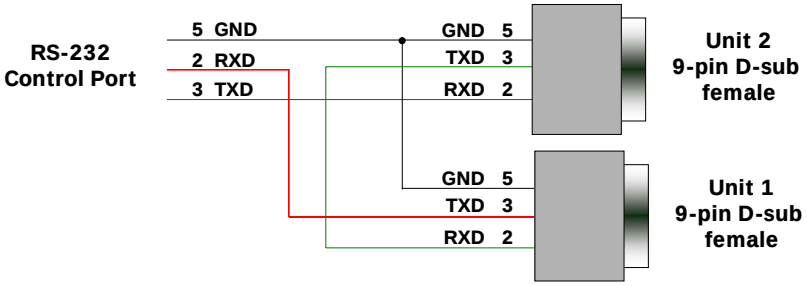
RS-232 wiring for control or programming should only use pins 2, 3, 5. Cables with all pins wired can lock out front-panel programming and data communication (Pins 4 and 9 are inputs).

Multiple Tuners

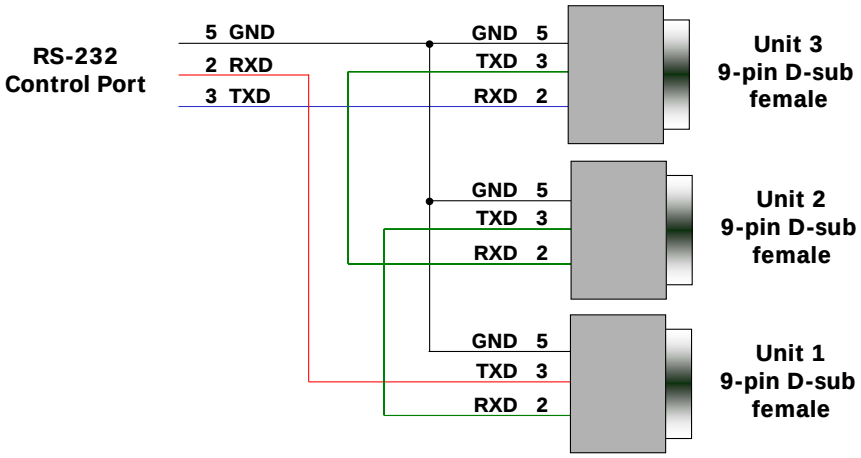
Up to nine tuners can be daisy-chained from one RS-232 control port. Remember that you will need to use the Unit# address in your programming when you control more than one tuner from the same control port.

Set the first unit in the RS-232 chain to the highest Unit#, then wire in sequence to the last tuner in the chain. The reason for this is that CR tuners use an intelligent data bus - the highest number tuner receives all commands, and then passes on commands addressed to tuners with lower unit numbers. The next tuner in the chain does the same, and so on until the last unit.

RS-232 Wiring – Two Units

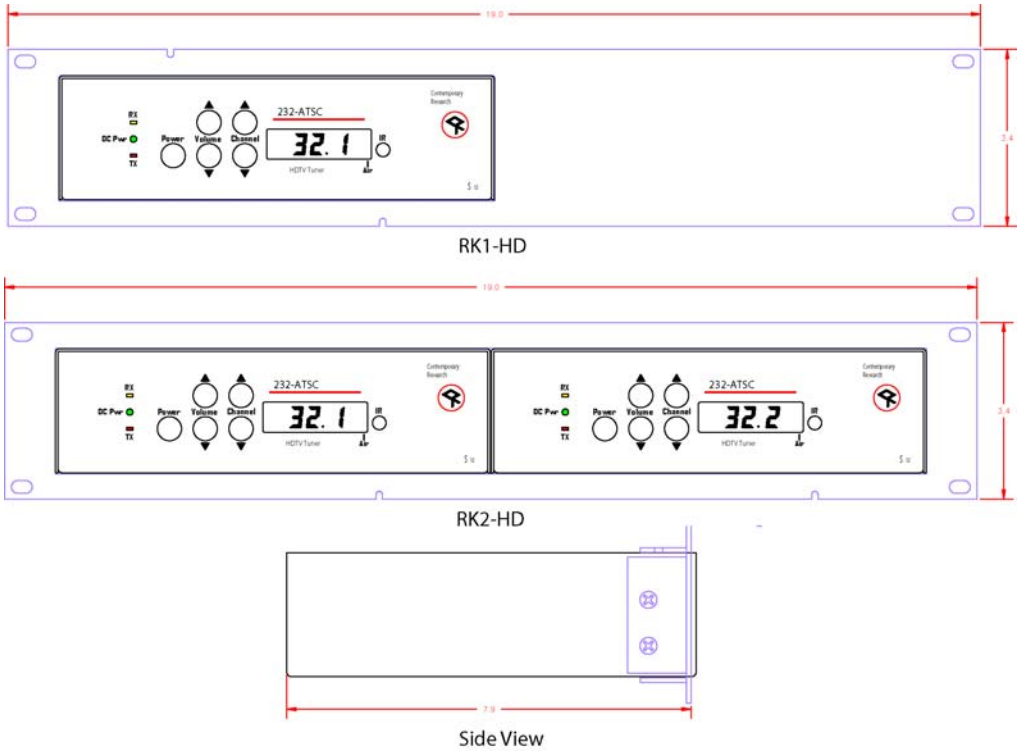


RS-232 Wiring – Three Units



Rack Mounting

Two options are available for rack-mounting tuners.



RK1-HD

- Remove screws at the front of each side of case.
- Insert 232-ATSC into RK1-HD frame.
- Re-install side screws through flanges in rack frame.

RK2-HD

- Remove two screws from the top and outside corner of each tuner, matching screw positions in the RK2-HD.
- Insert each tuner into the rack mount.
- Re-install side and top screws through flanges in rack frame.

Safety Instructions

Read before operating equipment.

1. Cleaning - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

2. Power Sources - Use supplied or equivalent UL/CSA approved low voltage DC plug-in transformer.

3. Outdoor Antenna Grounding - If you connect an outside antenna or cable system to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

4. Lightning - Avoid installation or reconfiguration of wiring during lightning activity.

Power Lines - Do not locate an outside antenna system near overhead power lines or other electric light or power circuits or where it can fall into such power lines or circuits. When installing an outside antenna system, refrain from touching such power lines or circuits, as contact with them might be fatal.

5. Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

6. Object and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.

7. Servicing - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

8. Damage Requiring Service - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
   - When the power supply cord or plug is damaged.
   - If liquid spills or objects fall into the product.
   - If the product is exposed to rain or water.
   - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
   - If the video product is dropped or the cabinet is damaged.
   - When the video product exhibits a distinct change in performance, this indicates a need for service.

* Note to CATV system installer: This reminder is provided to call CATV system installer's attention to Article 820-40 of the National Electrical Code (Section 54 of Canadian Electrical Code, Part I), that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as possible.

Limited Warranty

Contemporary Research Corporation (CR) warrants this product to be free from defects in material and workmanship under normal use for a period of two years from the date of purchase from CR. Should such a defect occur CR will repair or replace, at their option, the defective product at no cost for parts or labor.

This warranty extends to product purchased directly from CR or an Authorized CR Dealer. Consumers should inquire from selling dealer as to the nature and extent of the dealer's warranty, if any.

All warranty claims must be shipped pre-paid to the factory. Call or fax to obtain a Return Material Authorization (RMA) number.

CR is not liable for any damages caused by any of its products or for the failure of any products to perform, including any lost profits, lost savings, incidental damages, or consequential damages. CR is not responsible for any claim made by a third party or made for you by a third party. This limitation of liability applies whether damages are sought, or a claim is made, under this warranty or as a tort claim (including negligence and strict product liability), a contract claim, or any other claim. This limitation of liability cannot be waived or amended by any person. This limitation of liability will be effective even if CR or an authorized representative of CR has been advised of the possibility of any such damages.

Some states do not allow a limitation of how long an implied warranty lasts. Some states do not allow the limitation or exclusion of incidental or consequential damages for consumer products. In such states, the limitation or exclusion of the Limited Warranty may not apply to you. This Limited Warranty gives you specific legal rights. You may also have other rights that may vary from state to state. You are advised to consult applicable state laws for a full determination of your rights.

Except as expressly set forth in this Limited Warranty, CR makes no other warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose. CR expressly disclaims all warranties not stated in this Limited Warranty. Any implied warranties that may be imposed by law are limited to the terms of this Limited Warranty.